

Hit List

Clear	Generate Collection	Print	Fwd Refs	Blwd Refs
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Search Results - Record(s) 1 through 4 of 4 returned.

☒ 1. Document ID: US 6285999 B1

L10: Entry 1 of 4

File: USPT

Sep 4, 2001

US-PAT-NO: 6285999

DOCUMENT-IDENTIFIER: US 6285999 B1

TITLE: Method for node ranking in a linked database

DATE-ISSUED: September 4, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Page; Lawrence	Stanford	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE	CODE
The Board of Trustees of the Leland Stanford Junior University	Stanford	CA				02

APPL-NO: 09/ 004827 [PALM]

DATE FILED: January 9, 1998

PARENT-CASE:

CROSS-REFERENCES TO RELATED APPLICATIONS This application claims priority from U.S. provisional patent application Ser. No. 60/035,205 filed Jan. 10, 1997, which is incorporated herein by reference.

INT-CL: [07] G06 F 17/30

US-CL-ISSUED: 707/5; 707/7, 707/501

US-CL-CURRENT: 707/5; 707/7, 715/501.1

FIELD-OF-SEARCH: 707/100, 707/5, 707/7, 707/513, 707/1-3, 707/10, 707/104, 707/501, 345/440, 382/226, 382/229, 382/230, 382/231

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
<u>4953106</u>	August 1990	Gansner et al.	345/440
<u>5450535</u>	September 1995	North	395/140

<u>5748954</u>	May 1998	Mauldin	395/610
<u>5752241</u>	May 1998	Cohen	707/3
<u>5832494</u>	November 1998	Egger et al.	707/102
<u>5848407</u>	December 1998	Ishikawa et al.	707/2
<u>6014678</u>	January 2000	Inoue et al.	707/501

OTHER PUBLICATIONS

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ART-UNIT: 211

PRIMARY-EXAMINER: Black; Thomas

ASSISTANT-EXAMINER: Le; Uyen

ATTY-AGENT-FIRM: Harrity & Snyder L.L.P.

ABSTRACT:

A method assigns importance ranks to nodes in a linked database, such as any database of documents containing citations, the world wide web or any other hypermedia database. The rank assigned to a document is calculated from the ranks of documents citing it. In addition, the rank of a document is calculated from a constant representing the probability that a browser through the database will randomly jump to the document. The method is particularly useful in enhancing the performance of search engine results for hypermedia databases, such as the world wide web, whose documents have a large variation in quality.

29 Claims, 3 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWAC	Draw D
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☒ 2. Document ID: US 6112202 A

L10: Entry 2 of 4

File: USPT

Aug 29, 2000

US-PAT-NO: 6112202

DOCUMENT-IDENTIFIER: US 6112202 A

TITLE: Method and system for identifying authoritative information resources in an environment with content-based links between information resources

DATE-ISSUED: August 29, 2000

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Kleinberg; Jon Michael	Los Gatos	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE	CODE
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APPL-NO: 08/ 813749 [PALM]

DATE FILED: March 7, 1997

INT-CL: [07] G06 F 17/30

US-CL-ISSUED: 707/5; 707/9, 707/101

US-CL-CURRENT: 707/5; 707/101, 707/9

FIELD-OF-SEARCH: 707/1, 707/2, 707/4, 707/5, 707/10, 707/100, 707/101, 707/102, 707/501

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
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<u>5257185</u>	October 1993	Farley et al.	707/100
<u>5446891</u>	August 1995	Kaplan et al.	707/2
<u>5778363</u>	July 1998	Light	707/5
<u>5826031</u>	October 1998	Nielsen	395/200.63
<u>5835905</u>	November 1998	Pirolli et al.	707/3

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ART-UNIT: 271

PRIMARY-EXAMINER: Black; Thomas G.

ASSISTANT-EXAMINER: Loomis; John

ATTY-AGENT-FIRM: Tran; Khanh Q.

ABSTRACT:

A system and method are provided for searching for desired items from a network of information resources. In particular, the system and method have advantageous applicability to searching for World Wide Web pages having desired content. An initial set of pages are selected, preferably by running a conventional keyword-based query, and then further selecting pages pointing to, or pointed to from, the pages found by the keyword-based query. Alternatively, the invention may be applied to a single page, where the initial set includes pages pointed to by the single page and pages which point to the single page. Then, iteratively, authoritativeness values are computed for the pages of the initial set, based on the number of links to and from the pages. One or more communities, or "neighborhoods", of related pages are defined based on the authoritativeness values thus produced. Such communities of pages are likely to be of particular interest and value to the user who is interested in the keyword-based query or the single page.

57 Claims, 7 Drawing figures

Full	Title	Citation	Front	Review	Classification	Date	Reference				Claims	KWIC	Draw D
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☐ 3. Document ID: US 6285999 B1

L10: Entry 3 of 4

File: DWPI

Sep 4, 2001

DERWENT-ACC-NO: 2001-595486

DERWENT-WEEK: 200467

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TITLE: Computer-implemented linked document scoring method applicable for analyzing linked databases involves processing linked documents based on linked document scores assigned according to linking document score

INVENTOR: PAGE, L

PRIORITY-DATA: 1997US-035205P (January 10, 1997), 1998US-0004827 (January 9, 1998)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
<u>US 6285999 B1</u>	September 4, 2001		011	G06F017/30

INT-CL (IPC): G06 F 17/30

ABSTRACTED-PUB-NO: US 6285999B

BASIC-ABSTRACT:

NOVELTY - The method involves obtaining number of hypertext documents (A,B,C) consisting of the linked documents and linking documents. Each of the linked documents is pointed by a link in one or more of the linking documents. A predetermined score is assigned to each of the linked documents based on the scores of one or more linking documents. The linked documents are processed according to the assigned scores.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

- (a) a computer-implemented linked document ranking method;
- (b) and a computer-readable medium which stores processing instructions for linked document score determination.

USE - Applicable for analyzing linked databases.

ADVANTAGE - Simplifies determination of importance of document through counting of number of citations or backlinks. Enables ranking documents in large linked database even in world wide web.

DESCRIPTION OF DRAWING(S) - The figure shows the diagram of three-document web illustrating rank in each document.

Hypertext documents A,B,C

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KMC	Draw D
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☐ 4. Document ID: US 6112202 A

L10: Entry 4 of 4

File: DWPI

Aug 29, 2000

DERWENT-ACC-NO: 2000-663779

DERWENT-WEEK: .200064

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TITLE: Computer program product for searching information resources in WWW, directs computer system to produce final set of information resources based on produced initial and secondary authoritativeness information

INVENTOR: KLEINBERG, J M

PRIORITY-DATA: 1997US-0813749 (March 7, 1997)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
<u>US 6112202 A</u>	August 29, 2000		016	G06F017/30

INT-CL (IPC): G06 F 17/30

ABSTRACTED-PUB-NO: US 6112202A

BASIC-ABSTRACT:

NOVELTY - A main controller provided on the recording medium, directs the computer system to produce final set of information resources based on produced initial and secondary authoritativeness information about a set of information resources pointed to by links in resources of input set. The initial set and the succeeding sets of information are iterated until specific condition is attained.

DETAILED DESCRIPTION - The controllers provided on the recording medium, direct the computer system to identify an initial set of information resources, and to define initial authoritativeness information for the initial set, respectively. Another controller provided on the recording medium, directs the computer system to generate a final set of information sources, based on the two generated authoritativeness information. The information resources include WWW pages and the

content based links including hyperlinks. INDEPENDENT CLAIMS are also included for the following:

- (a) search execution method of information resources;
- (b) search execution system of information resources

USE - For executing search of information resources in hypertext/hyperlinked environments such as WWW. And also for defining communities of computer network user based on receiver e-mail messages, and for telephone call records.

ADVANTAGE - Since the existing link structure is objectively observable, the evaluation of authoritativeness is automated.

DESCRIPTION OF DRAWING(S) - The figure shows the flowchart illustrating the search execution method of information resources.

Full	Title	Citation	Front	Review	Classification	Date	Reference			Claims	KWIC	Draw. D
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Clear	Generate Collection	Print	Fwd Refs	Bkwd Refs	Generate OACS
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Term	Documents
"6285999"	4
6285999S	0
(9 OR ("6285999".PN.)).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	4
(L9 OR 6285999.PN.).PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD.	4

Display Format:

[Previous Page](#)

[Next Page](#)

[Go to Doc#](#)

[First Hit](#) [Fwd Refs](#)[Previous Doc](#)[Next Doc](#)[Go to Doc#](#)

End of Result Set



Generate Collection

Print

L12: Entry 1 of 1

File: USPT

Aug 29, 2000

DOCUMENT-IDENTIFIER: US 6112202 A

TITLE: Method and system for identifying authoritative information resources in an environment with content-based links between information resources

Brief Summary Text (47):

Finally, "neighborhoods" or "communities" of pages are obtained from the resultant authoritativeness information. A single neighborhood may be obtained, or several distinct neighborhoods may be obtained by partitioning the scores into ranges.

Detailed Description Text (14):

The method can be directly extended to produce several, relatively disjoint, communities of authorities and hubs. The method of the invention, when practiced in such a fashion, serves a clustering function. That is, the more disjoint these communities are, the more they are capable of corresponding to intuitive partitions of the query topic. The partitions may be made according to various criteria, including both semantic distinctions and social "clustering" among creators of hyper-links.

Detailed Description Text (32):

In step 28, hub and authority vectors H and A are defined, where each term of each of the vectors corresponds with one of the pages in the neighborhood. The iterative algorithm is to operate on these vectors.

Detailed Description Text (34):

The vector H is initialized as follows:

Detailed Description Text (38):

The entries in these two vectors are now updated iteratively (step 30). One preferred method for performing this updating is given in flowchart form in the next several steps of FIG. 1, and depicted graphically in FIGS. 4 and 5.

Detailed Description Text (39):

If u and v are pages, let $u.fwdarw.v$ denote the presence of a link from u to v. Then the values of the terms of the hub and authority vectors H and A are updated as follows:

Detailed Description Text (40):

These two equations are shown respectively as steps 32 and 34 in FIG. 1. Equation (1) is illustrated in FIG. 4, in which three pages u_1 , u_2 , and u_3 have links to a page v. The authority vector's term $A[v]$ for the page v is the sum of the hub vector values $H[u_1]$, $H[u_2]$, and $H[u_3]$ for the three pages u_1 , u_2 , and u_3 .

Detailed Description Text (41):

Similarly, Equation (2) is illustrated in FIG. 5, in which a page v has links to ##EQU1## three pages u_1 , u_2 , and u_3 . The hub vector's term $H[v]$ for the page v is the sum of the authority vector values $A[u_1]$, $A[u_2]$, and $A[u_3]$ for the three pages u_1 , u_2 , and u_3 .

Detailed Description Text (42):

It will be seen that, as these iterations are performed, the values of the terms of the hub and authority vectors will increase. Accordingly, the vectors are preferably normalized, to prevent the numerical values from growing too large (step 36). One preferred normalization method is the following: ##EQU2##

Detailed Description Text (44):

It will be seen that, as the successive iterations proceed, the hub and authority vector values will increase based on the number of links common to the page populations. The pages unrelated to the desired subject matter, which will have relatively few links to the pages related to the desired subject matter, will have relatively low values, and will, in effect, be "weeded out."

Detailed Description Text (45):

When the iterations have been completed, FIG. 1 concludes by outputting its final results. A preferred output technique, given in steps 38 and 40, is to scan the hub and authority vectors H and A, to find the k largest terms, k having been specified in step 2, and being presumptively smaller than the number of pages identified.

Detailed Description Text (48):

The above-described method may be extended to locate several communities of authorities and hubs. Iterations are performed in essentially the same manner as described above, but now, several vectors of each type are maintained. For instance, if there are to be q hub vectors and q authority vectors, representing q number of distinct neighborhoods, then the hub and authority vectors are shown as distinguished by index subscripts, as follows: A.sub.0, . . . , A.sub.q and H.sub.0, . . . , H.sub.q.

Detailed Description Text (50):

Initially, the implementation of FIG. 6 chooses the additional input parameter q, a number of neighborhoods (i.e., of hub and authority vectors) to be found (step 42). In step 44, initial values for the terms of the hub and authority vectors are set.

Detailed Description Text (51):

However, the initialization is preferably performed in a different manner from what was done in step 28 of FIG. 1. The objective of this embodiment is to come up with distinct neighborhoods. Consequently, it is necessary that the final result of the iterations be multiple distinct vectors. In order for the iterations to converge to multiple distinct vectors, it is necessary that no two of the vectors become equal during the course of the iterations.

Detailed Description Text (52):

For this purpose, the vectors are initialized so as to be orthogonal. Moreover, following each iteration, they are again updated so as to remain orthogonal. This updating step can be accomplished by the standard Gram-Schmidt procedure, as given in G. Golub, C.F. Van Loan, "Matrix Computations", Johns Hopkins University Press, 1989.

Detailed Description Text (53):

In light of the foregoing, the preferred embodiment of the invention is as follows: Before the iterations begin, in step 46 the hub vectors are orthogonalized. The initial orthogonalization may conveniently be performed by assigning each coordinate a real-number value chosen uniformly at random from the interval [0,1].

Detailed Description Text (54):

The iterations are now performed (step 48). For a given iteration, the summing, similar to those given above in Equations (1) and (2), is done separately over each pair of hub and authority vectors (A.sub.i, H.sub.i).

Detailed Description Text (55):

At the end of each iteration, the vectors are modified to be mutually orthogonal. This can be accomplished by the standard Gram-Schmidt procedure given in G. Golub (supra).

Detailed Description Text (56):

A preferred sequence of the steps of an iteration are given in FIG. 6, as follows: In step 50, the authority vectors are updated. When they are all updated, they are then orthogonalized (step 52). Then, in step 54, the hub vectors are updated. When they are all updated, they are then orthogonalized (step 56). This completes an iteration. The iteration is repeated a desired number of times.

Detailed Description Text (57):

As with the embodiment of FIG. 1, the largest (positive) entries of A.sub.0 and H.sub.0 are returned as the primary hubs and authorities. One can then define 2q additional authority/hub communities, by taking the q most positive and the q most negative entries from each of the pairs of vectors (A.sub.i, H.sub.i), for i=1, . . . , q.

Detailed Description Text (58):

Note that the Gram-Schmidt procedure, which includes subtractions, can produce negative values for vector terms. The positivity or negativity of the entries does not have a direct meaning in the context of the method. Rather, a more significant meaning is attributed to the magnitudes, i.e., absolute values, of the terms. In general, the more links to or from a page, or, more broadly, the greater the authoritativeness of the page as to the desired subject matter, the greater the magnitude of the value will be.

Detailed Description Text (59):

The noteworthy property of the entries, taken as a group, is simply that they may be partitioned into two or more communities, based on their ranges of values. It may be convenient or desirable, where one set is positive and the other set is negative, to partition at the zero value. However, it is not crucial that the partitions be evenly distributed or symmetric. More generally, any subset of the communities can be returned, possibly according to additional criteria imposed by the user on the set of pages.

Detailed Description Text (60):

For discussion purposes, however, an example will be given in which partitioning is to be symmetric about the zero point.

Detailed Description Text (64):

In step 64, a community, indexed as community 2i-1 (for $1 < i < q$), is defined, by choosing k pages with largest coordinates in the vector H[i] as hubs (step 66), and choosing k pages with largest coordinates in the vector H[i] as hubs (step 66).

Detailed Description Text (65):

Next, in step 70, a community, indexed as community 2i (for $1 < i < q$), is defined, by choosing k pages with smallest coordinates in the vector H[i] as hubs (step 66), and choosing k pages with smallest coordinates in the vector H[i] as hubs (step 66).

Detailed Description Text (69):

The hub and authority vectors H and A correspond to the principal eigenvectors of two matrices associated with the set of pages.

Detailed Description Text (72):

In particular, the authority vector A is the principal eigenvector of M, and the hub vector H is the principal eigenvector of N.

Detailed Description Text (73):